

REMARKS

This amendment is in response to the Office Action of July 15, 2003 whose initial period of response is set to expire on October 15, 2003.

Claims 1 through 52 are currently pending in the application.

35 U.S.C. § 112 Claim Rejections

Claims 1 through 52 are rejected under 35 U.S.C. § 112, first paragraph, as failing to comply with the written description requirement. The claims contain subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Applicants respectfully traverse this rejection, as hereinafter set forth.

The Office Action asserts that “[w]ith respect to the arguments that the references do not disclose the aspect ratio, the applicant’s specification does not explicitly disclose that ratio, in paragraphs [0006 to 0009] or any other parts thereafter.” Applicants submit that the third and eighth sentences of paragraph [0008] contain such aspect ratios, where the aspect ratios of 5.0 and 2.5, respectively, are disclosed. Furthermore, the significance of the aspect ratio is disclosed in the same paragraph, where the problem of poor titanium nitride coverage with conventional methods at small aspect ratios is disclosed. It is clear from paragraph [0008] that Applicants’ invention pertains to small aspect ratio situations, and thus the limitations are supported by the specification. Therefore, presently amended claims 1 through 52 are allowable under the provisions of 35 U.S.C. § 112, first paragraph.

35 U.S.C. § 103(a) Rejections

Rejection Based on Aoki et al. (U.S. Patent 5,629,539) in view of Iacoponi (U.S. Patent 5,545,592)

Claims 1 through 52 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Aoki et al. (U.S. Patent 5,629,539) in view of Iacoponi (U.S. Patent 5,545,592).

Applicants submit that in order to establish a *prima facie* case of obviousness under 35 U.S.C. § 103 three basic criteria must be met. First, there must be some suggestion or motivation,

either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Third, the cited prior art reference must teach or suggest all of the claim limitations. Furthermore, the suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on Applicants' disclosure.

As an initial matter, in light of the Office Action section "Response to Arguments" section, Applicants respectfully attempt to clarify their position to alleviate any ambiguities which have arisen as a result of Applicants' prior response.

First, it is stated in the second sentence of such section that "[t]he Applicant still asserts that Aoki cannot be combined with Iacoponi but this time argues that Aoki teaches away from the combination because Aoki uses a simplified process. The Office Action asserted that the cited references show all the elements of the claims despite the differences in process between the two inventions. Applicants respectfully submit that the argument proffered in the previous response to the Office Action is *not* that a particular method of manufacturing detracts from the obviousness of Applicants' DRAM in light of the proposed combination of references. Applicants instead assert that the method of Aoki, which provides for only partially manufacturing the particular DRAM taught in Aoki, precludes simply substituting the elements taught by Iacoponi into the fabrication process of Aoki in order to fully manufacture Applicants DRAM. The product of Aoki would have to be partially undone in order to substitute the elements taught in Aoki with the elements of Iacoponi. Applicants thus suggested that Aoki actually teaches against or away from any such substitution because the method of Aoki, which was particularly suited to fabricating the particular DRAM structure of Aoki, would make a product requiring partial "unbuilding" or "destroying" by removal of elements in order to be modified by additional features from Iacoponi. Furthermore, an advantageous feature of the method and structure of Aoki is the ability to add these elements in the same step as other elements, providing a simplified procedure. Thus, the very thing which makes Aoki convenient stands in the way of adding elements from Iacoponi. In this manner, please refer to the prior

response, the third paragraph under the discussion of rejections under 35 U.S.C. 103. It is reproduced below for the Examiner's convenience.

“[T]here is no suggestion in either of the references or in the knowledge available to one skilled in the art to substitute the titanium (150) and titanium nitride (160) layers of Iacoponi for the pad electrode (21a) of Aoki to arrive at Applicants' invention as per the claims as amended. In fact, Aoki teaches away from such a combination. Aoki cuts production steps by forming the pad electrode at the same time and out of the same material as the adjacent electrodes (“cylindrical storage node electrodes”). Col 7, lines 43-47. Note the identical shadings of both types of electrodes in Figure 1b. If Aoki's pad electrode were to be exchanged for the two layers of Iacoponi, the fabricator following directions for creating the DRAM in Figure 1b would have to do one of two things: either follow the method of Aoki only up to and including the formation of the electrodes, and subsequently perform a mechanical or chemical elimination of the pad electrode; or greatly alter Aoki's simple fabrication scheme, in order to avoid forming the pad electrode in the first place. Thus, Applicants submit that one of ordinary skill in the art who reads Aoki's disclosure is forced to resort to the distortion of Aoki's simple procedure in order to accommodate the substitution of Iacoponi's layers for Aoki's pad electrode. Expressed differently, the visual substitution based on Figure 1b of Aoki and Figure 7 of Iacoponi is not nearly straightforward as it may seem at first glance. One of ordinary skill in the art who takes advantage of the simplicity of procedure accompanying Aoki's figures will find that Aoki's disclosure does not teach or suggest the proposed substitution, and that Aoki's recommended procedure, far from embracing the substitution, in fact does not accommodate it. For these reasons, Aoki teaches away from the substitution.”

Applicants respectfully submit that Aoki teaches away from any combination with Iacoponi.

The Office Action further asserted that “[t]he combination may provide additional steps to Aoki, but with respect to device claims, Aoki does not teach away from the combination.”

Applicant respectfully submits that the might be true if Aoki taught a device which can be manufactured by any one of a number of methods, and Aoki merely suggested one of the methods. However, the method of Aoki and the product of the method are so specific to one another that Aoki actually teaches a structure and *the* method for making it. The method teachings can thus teach away from structural substitutions such as the one put forth by the Examiner. Most exemplary of the inseparability of the device and method teachings is the second paragraph of the Summary section, which states “[i]n order to obtain the above object, the present invention uses the following structure and manufacturing method.” Applicants thus submit that the method required to form the structure can thus teach against the forementioned structural combination.

As a peripheral matter, the two sentences in the Office Action which are between the two sections separately mentioned above refer to the combination of Iacoponi’s CVD titanium nitride layer with the teachings of Aoki. Fourth and fifth sentence in “Response to Arguments” section.

While this is addressed below, Applicants respectfully presume that the sections discussed above (total of four sentences) are in response to Applicants’ arguments from the latest response which pertain to the combination of Iacopone’s titanium and titanium nitride layers for the pad electrode of Aoki. Applicants infer the foregoing interpretation because in the above-discussed sections, the Office Action refers to a “simplified process,” as well as to the “additional steps” of Aoki.

However, Applicants interpret the comments in the Office Action to also argue that the application of a CVD titanium nitride layer, mentioned at Col. 1, lines 61 through 63 of Iacoponi, over the titanium layer of Aoki, is obvious. It is asserted that “although Aoki uses a simplified process to form the device, one would still recognize the benefits of Iacoponi’s CVD process (provide adhesion promotion of tungsten). If one were to look for an improved contact structure, Iacoponi would be relied upon to teach such an improvement.” As set forth above, the substitution of Iacoponi’s layers is not taught or suggested, let alone the application of one of such layers by CVD. Furthermore, the suggested motivation to combine (promote adhesion of the tungsten) is not mentioned in either reference, and Applicants respectfully submit that neither the references nor the knowledge available to one “skilled in the art” suggests a problem of “tungsten adhesion,” such that a search for a solution would be stimulated. Moreover, it is not

clear from the references and knowledge available to one “skilled in the art” that a layer of titanium nitride would promote tungsten adhesion any better than the pad electrode materials such as polycrystalline silicon used in Aoki. Col. 8, line 67; Fig. 1b, 2I.

In the Office Action it is states at the bottom of page 5 of the latest response that “[i]f Aoki were to teach away from the CVD TiN and tungsten then Aoki would flat out state that the material provides disadvantages and would not be used. Aoki does not reject the use of CVD TiN and tungsten...and thus does not teach away from such a device combination.” Applicants very respectfully assert that a failure to exclude is not the same as a teaching, and a “teaching away” may be more subtle than a blatant statement. The incompatibility of the teachings of one reference with regard to those of another, such as the case explained above, can be considered a “teaching away.”


In addition to teaching away from their combination, the combined references do not teach the required aspect ratio. In the Office Action it is stated that “the combined inventions of Aoki and Iacoponi disclose all the elements of the claims, have the same structure and materials as the instant invention, and thus inherently form a device having the desired aspect ratio.” The aspect ratio is a ratio of dimensions. Neither reference even discloses absolute, let alone relative dimensional information. Because aspect ratios lower than Applicants’ claim elements of 2.5 and 5 are possible (such as cases in which the DRAM does not have stacked capacitors), the required aspect ratio cannot be *inherent* in the reference combination, even if the statement in the Office Action were correct. Furthermore, such a claim element is neither taught nor suggested by the cited prior art. Aoki doesn’t mention aspect ratios. Iacoponi does not even discuss or allude to the inclusion of stacked capacitors in a DRAM, which is the reason aspect ratios are so high in modern DRAMs. Thus Iacoponi does not and clearly cannot contemplate a high aspect ratio situation, and its combination with Aoki cannot be interpreted to contain Applicants’ high aspect ratio limitation. Thus the references as combined by in the Office Action do not “teach or suggest all claim limitations,” as required by 35 U.S.C. § 103(a).

Applicants thus submit that independent claims 1, 3, 10, 13, 17, 22, 24, 31, 34 and 38 are allowable, with claims 2, 4 through 9, 11, 12, 14 through 16, 18 through 21, 23, 25 through 30, 32, 33, 35 through 37, and 39 through 52 are allowable as depending from allowable independents.

Applicants submit that claims 1 through 52 are clearly allowable over the cited prior art.

Applicants request the allowance of claims 1 through 52 and the case passed for issue.

Respectfully submitted,



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